	Centre Number	Candidate Number
Candidate Name ______________________		

International General Certificate of Secondary Education
UNIVERSITY OF CAMBRIDGE LOCAL EXAMINATIONS SYNDICATE

PHYSICS 0625/3

PAPER 3

MAY/JUNE SESSION 2000 1 hour 15 minutes

Candidates answer on the question paper.
Additional materials:
Electronic calculator and/or Mathematical tables
Protractor
Ruler (30 cm)

TIME 1 hour 15 minutes

INSTRUCTIONS TO CANDIDATES

Write your name, Centre number and candidate number in the spaces at the top of this page.

Answer **all** questions.

Write your answers in the spaces provided on the question paper.

INFORMATION FOR CANDIDATES

The number of marks is given in brackets [ ] at the end of each question or part question.

FOR EXAMINER'S USE	
1	
2	
3	
4	
5	
6	
7	
8	
9	
10	
TOTAL	

This question paper consists of 14 printed pages and 2 blank pages.

(NH) QF05709/2

1 A firework leaves the ground with an initial velocity of 45 m/s, travelling vertically upwards. It reaches a maximum height of 100 m.

At this point the firework fails to explode and falls back down the same vertical path to the ground.

At any point on its path, the firework has both a velocity and a speed.

(a) Using the terms **vector** and **scalar**, explain the difference between velocity and speed.

....

....

....

....[3]

(b) Fig. 1.1 is a graph which shows the height of the firework above the ground during the first 5 s of its journey.

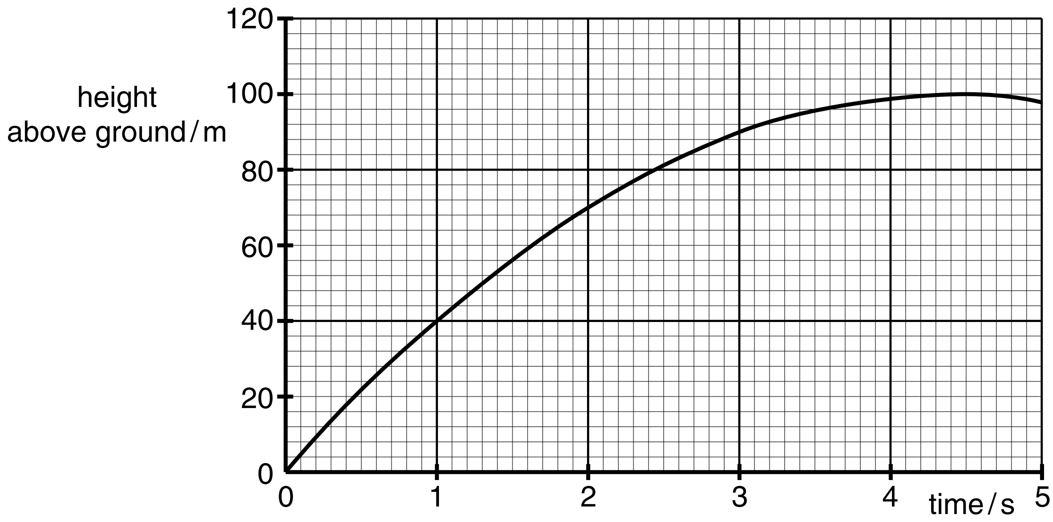

Fig. 1.1

(i) Use the information on the graph to

1. find the time taken for the firework to reach its maximum height above the ground,

....

2. describe how the motion of the firework changes over the first 5 s of its journey.

....

....

....

....

(ii) The acceleration of free fall is 10 m/s^2 and air resistance on the firework is negligible.

State

1. the deceleration of the firework as it is rising,

deceleration = ...

2. the total time taken for the firework to rise 100 m and then to fall back to the ground.

time taken = ...

(iii) State the velocity with which the falling firework hits the ground.

velocity = ...

[8]

For Examiner's Use

2 In an experiment to find the specific latent heat of fusion of ice, an electric heater, of power 200 W, is used.

The following readings are taken.

mass of ice at 0 °C, before heating started, 0.54 kg
mass of ice at 0 °C, after 300 s of heating, 0.36 kg

(a) Calculate a value of the specific latent heat of fusion of ice.

specific latent heat of fusion of ice = ... [4]

(b) Explain, in molecular terms, how heat is transferred from the surface of a block of ice to its centre.

....

....

....

....

....[2]

For Examiner's Use

3 Fig. 3.1 shows a simple beam balance made from a pivot and a metre rule.

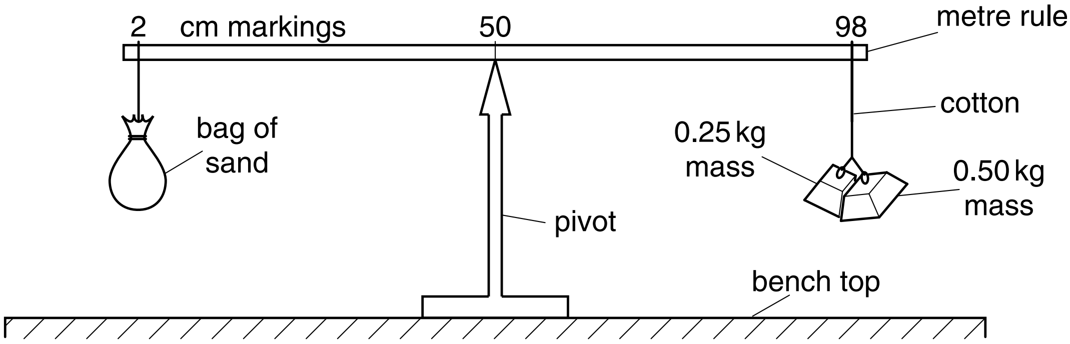

Fig. 3.1

(a) Find

(i) the mass of the bag of sand,

mass = ...

(ii) the weight of the bag of sand. (The acceleration of freefall is 10 m/s^2.)

weight = ... [3]

(b) Explain, in terms of moments of forces, why the beam balances.

....

....

....

....[3]

(c) The cotton holding the 0.50 kg mass snaps and the mass falls to the bench. It strikes the bench at a speed of 1.2 m/s.

Calculate its kinetic energy just before it hits the bench.

kinetic energy of the mass = ... [3]

(d) On impact with the bench, the mass bounces up a small distance. Some transformation of energy occurs during the impact. State the forms of the energy just before and just after the impact.

before: ....

after: ....[2]

For Examiner's Use

4 Fig. 4.1 shows a sealed box containing only dry air. At a particular instant, one of the air molecules in the box is situated at P and it is moving towards face ABCD along the direction shown by the arrow.

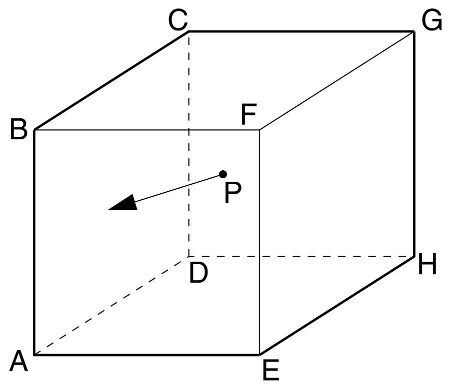

Fig. 4.1

(a) Describe and explain a possible path of the molecule within the box.

....

....

....

....

....[2]

(b) Explain how this molecule

(i) helps to cause a pressure on the side ABCD,

....

....

....

(ii) helps to cause an equal pressure on all the sides.

....

....

....[2]

(c) The box is squashed but no air leaks out. By calculation, complete the table below.

	volume of box /m^3	pressure /Pa	temperature /°C
before squashing	0.09	1.0×10^5	20
after squashing	0.04		20

[2]

5 Fig. 5.1 shows how a right-angled prism may be used to change the direction of a ray of light.

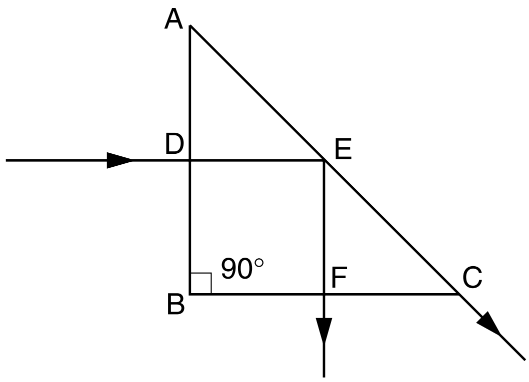

Fig. 5.1

(a) Explain why the ray of light does not change direction at D and at F.

....[1]

(b) State **one** property of the light which does change at D and at F. At each point say whether it increases or decreases.

....

....[2]

(c) At E the light splits, with one ray along the surface of the prism and one ray along EF. Draw the normal at E. Label the critical angle with the letter X and state its value.

critical angle = ... [2]

(d) The refractive index of this glass may be calculated using the formula

refractive index of glass = 1/sin *c*,

where *c* is the critical angle.

Use your value of the critical angle of this glass to calculate its refractive index.

refractive index = ... [2]

For Examiner's Use

6 **(a)** A sound wave in air is made up of compressions and rarefactions.

(i) State what is meant by a *compression*.

....

(ii) State what is meant by a *rarefaction*.

....
[2]

(b) The distance between two consecutive rarefactions in a sound wave is 2.5 m. The speed of sound in air is 330 m/s.

Calculate the frequency of this sound wave.

frequency = ... [2]

(c) A person makes a loud sound and hears the echo of this sound 1.2 s later.

Calculate how far the person is from the object causing the echo. Assume that the speed of sound is 330 m / s.

distance =.. [2]

For Examiner's Use

7 A student is given a battery, a switch, two insulated thick copper leads and a coil of resistance wire. On Fig. 7.1 only the coil is drawn in.

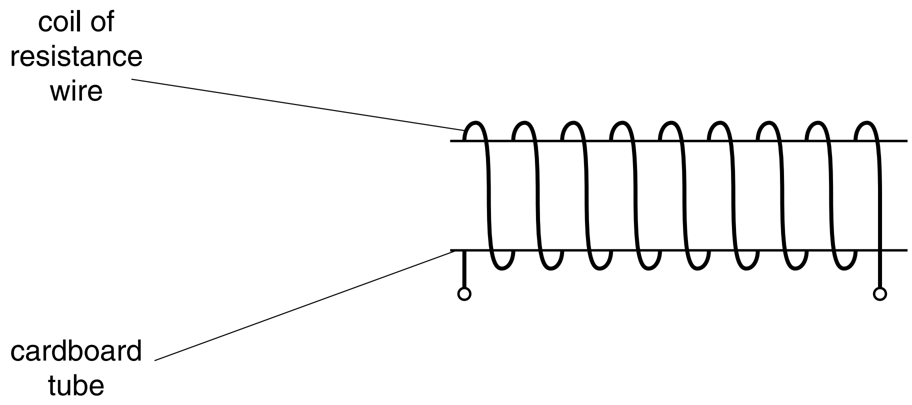

Fig. 7.1

(a) The student set up the apparatus to make a current flow through the coil.
Using standard symbols for components, complete a circuit diagram on Fig. 7.1. Also on Fig. 7.1, draw the magnetic field lines in and around the coil, with arrows to indicate the direction of the lines. [4]

(b) A charge of 16 C flows through the coil in 40 s.

Calculate the current in the coil.

current = ... [2]

For Examiner's Use

(c) The potential difference across the coil is 1.2 V.

(i) Calculate the energy released as heat in the coil in 40 s.

energy = ...

(ii) Calculate the resistance of the coil.

resistance =.. [4]

(d) The battery supplies 24 J of energy to drive 16 C of charge around the circuit. Define the e.m.f. of this battery.

....

....[2]

For Examiner's Use

8 Fig. 8.1 shows a transformer.

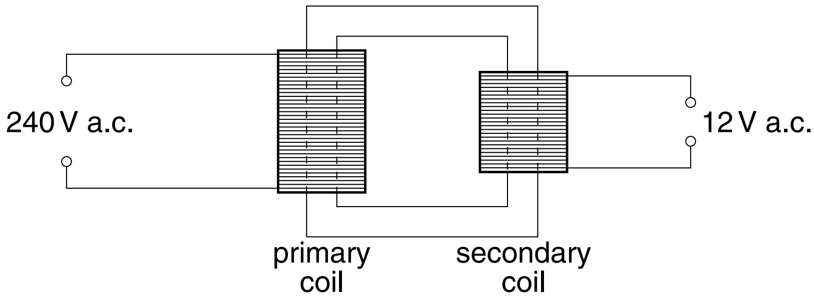

Fig. 8.1

(a) Explain why there is an e.m.f. across the secondary coil even though there is no electrical connection between the primary and secondary coils.

....

....

....

....

....[3]

(b) When the transformer is in use, the current in the secondary circuit is 3.2 A. The transformer may be considered 100% efficient.

Calculate the current in the primary coil.

current = ... [3]

For Examiner's Use

9 **(a)** Fig. 9.1 shows a beam of electrons about to enter the region between two charged metal plates.

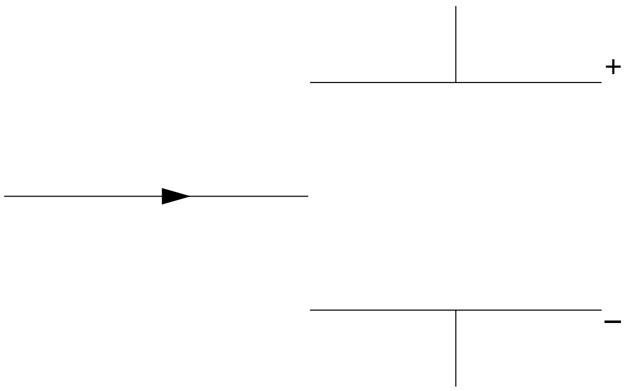

Fig. 9.1

On Fig. 9.1 continue the path of the electron beam between the plates

(i) for plates with a very small charge (label this path **P**),

(ii) for plates with the opposite charges to those shown on Fig. 9.1 (label this path **R**). [3]

(b) Fig. 9.2 shows another arrangement, similar to the first, but in this case the electron beam continues in a straight line because a magnet (which is not shown) has been placed near the plates.

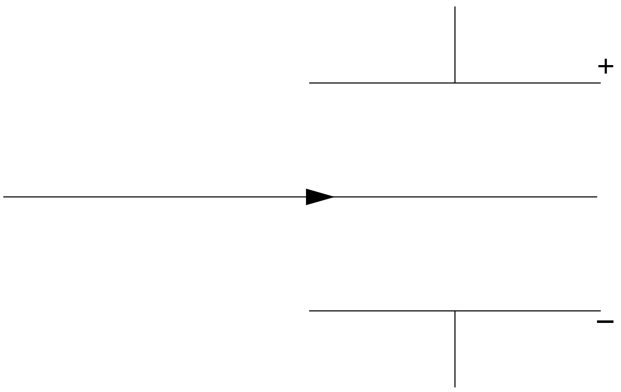

Fig. 9.2

Explain where you would place the N-pole of the magnet in order to achieve this effect. You may draw on the diagram if you feel that it will make your answer clearer.

....

....

....

....[3]

For Examiner's Use

10 **(a)** A radioactive source contains an isotope of thorium.
Thorium ($^{228}_{90}$Th) decays by α-particle emission to radium (Ra).
Write an equation to show this decay.

[2]

(b) The radium produced is also radioactive. Fig. 10.1 shows a laboratory experiment to test for the presence of the radioactive emissions from the thorium source, using a radiation detector.
In the laboratory there is a background count of 20 counts/minute.

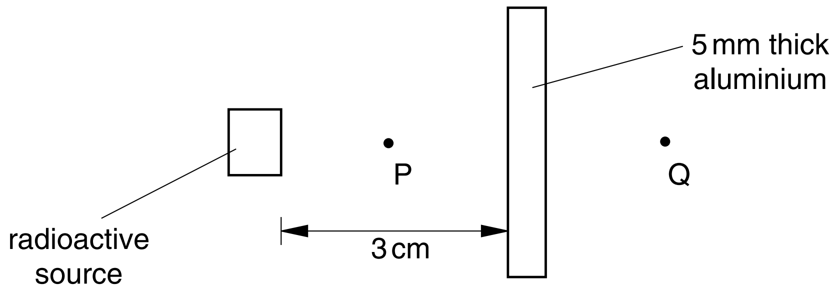

Fig. 10.1

The readings are given in the table.

position	reading in counts/minute
P	2372
Q	361

State and explain

(i) which radiation could be causing the count at Q,

....

....

....

(ii) which radiations could be causing the count at P.

....

....

....

[4]

[Turn over

For Examiner's Use

(c) All three types of radioactive emission cause some ionisation of gases.

(i) Explain what is meant by the term *ionisation of gases*.

....

....

....

(ii) Suggest a reason why γ-radiation produces very little ionisation.

....

....

....

[3]

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